MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2022/2023 (TERM ID 2215)

BMM1014 – MATHEMATICS FOR MANAGERS

(All Sections/Groups)

17 FEBRUARY 2023
9.00 a.m - 11.00 a.m
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 6 pages with 4 questions only.
2. Attempt all **FOUR** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the Answer Booklet provided.
4. Formulae are attached at the end of the question paper.

QUESTION 1

a) In year 2020, X-Copier Sdn Bhd, a copier manufacturer, has a monthly fixed cost of RM3030030 and a production cost of RM1011 for each copier manufactured. Each copier is sold for RM1511. In year 2022, the increase in material cost has raised the production cost to RM1209 per copier and the fixed cost increase to RM3036915.

i. Find the monthly break-even quantity of X-Copier Sdn Bhd in 2020.
(3 marks)

ii. Find the profit or loss in year 2020 if the company managed to sell 5910 copiers.
(3 marks)

iii. Find the break-even level of the company for the year 2022.
(3 marks)

iv. Find the profit or loss in year 2022 if the company managed to sell 6919 copiers.
(3 marks)

b) ABC Gift Shop sells a variety of food hampers. The small hamper contains five bananas, two apples and one orange for RM14.90. The medium hamper contains seven bananas, four apples and three oranges for RM29.60. The jumbo size contains ten bananas, six apples and six oranges for RM49.10. What price should be charged for the special food hamper that consists of five bananas, ten apples and eight oranges?
(13 marks)

(Total: 25 marks)

Continued...

QUESTION 2

A light bulb company produces HID bulbs and LED bulbs. Long-term projections indicate an expected demand of at least 100 HID and 80 LED bulbs daily. Due to production capacity, the company only can produce a maximum of 200 HID and 170 LED bulbs daily. To satisfy a shipping contract, the company must ship at least 200 bulbs daily. Each HID bulb gains a RM2.50 profit, and each LED bulb gains a RM6 profit.

a) Formulate the above problem as a Linear Programming problem.

(5 marks)

b) Graph and show the feasible region of the above problem clearly.

(6 marks)

c) Find the optimal solution and the associated maximum total profit.

(11 marks)

d) What would be the effect on the optimal solution if the profit of the LED bulb has increased from RM6 to RM9?

(3 marks)

(Total: 25 marks)

Continued...

QUESTION 3

a) Nurin took a loan for 9 years at a rate of 7.88% per annum on simple interest. If the total interest paid was RM6919, what was the principal?

(4 marks)

b) Find the accumulated amount after ten years if RM3600 is deposited in a saving account that earns interest at a rate of 10.53% per year compounded continuously.

(5 marks)

c) In April 2022, the average rate for a 30-year fixed mortgage was 4.43%. Assume a down payment of 20% on a home purchase of RM300900. What will be the monthly payment?

(6 marks)

d) Mr. Ken wishes to save some fund for his retirement. He puts RM1750 into an account every quarter for 25 years at 3.75% compounded quarterly. Find:

i. the amount in his retirement account after 25 years.

(6 marks)

ii. the total amount of interest that Mr. Ken earned.

(4 marks)

(Total: 25 marks)

Continued...

QUESTION 4

a) Evaluate the definite integral

$$\int_0^1 9x^8\sqrt{10-x^9}\,dx$$

(6 marks)

b) Shiny Appliances is marketing a new dishwasher. It determines that in order to sell x dishwashers, the price per dishwasher must be $p = 2300 - 1.5x$. It also determines that the total cost of producing x dishwashers is given by

$$C(x) = 20000 + 101x$$

How many dishwashers must the company produce and sell in order to maximize profit? What is the maximum profit?

(6 marks)

c) The total cost required to produce x thousand units of product model A and y thousands units of model B is given by

$$C(x,y) = 5x^2 + 8y^2 + 3xy - 4x - 100y - 14$$

The total revenue, in thousands of RM from the sale of these two models of product is approximated by

$$R(x,y) = 62x + 101y$$

How many of each model of product should be produced in order to get maximum profit? What is the maximum profit?

(13 marks)

(Total: 25 marks)

Continued...

LIST OF FORMULA

1. Quadratic Formula

The solution of the equation:
$ax^2 + bx + c = 0$,
$a \neq 0$, are $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

2. Simple Interest

Interest, $I = Prt$ (P = principal, r = interest rate, t = number of years)
Accumulated amount, $A = P(1 + rt)$

3. Compound Interest

Accumulated amount, $A = P(1 + i)^n$, where $i = r/m$, and $n = mt$ (m = number of conversion periods per year)

4. Continuous Compound Interest

$A = Pe^{rt}$

5. Effective Rate of Interest

$r_{eff} = (1 + r/m)^m - 1$

6. Present Value for Compound Interest

$P = A(1 + i)^{-n}$

7. Future Value of an Annuity

$$S = R\left[\frac{(1+i)^n - 1}{i}\right]$$

(S = future value of ordinary annuity of n payments of R dollars periodic payment)

8. Present Value of an Annuity

$$P = R\left[\frac{1-(1+i)^{-n}}{i}\right]$$

(P = present value of ordinary annuity of n payments of R dollars periodic payment)

Continued...

9. Amortization Formula

$$R = \left[\frac{Pi}{1 - (1 + i)^{-n}} \right]$$

(R = periodic payment on a loan of P dollars to be amortized over n periods)

10. Sinking Fund Formula

$$R = \left[\frac{Si}{(1 + i)^{n} - 1} \right]$$

(R = periodic payment required to accumulate S dollars over n periods)

11. Break-even point = $\frac{\text{Fixed Cost}}{\text{Contribution per unit}}$ (Contribution per unit = unit selling price – unit variable cost)

Sales (unit) = $\frac{\text{Fixed cost + Target profit}}{\text{Contribution per unit}}$

Calculus

12. Product rule

$$f(x) = u(x).v(x)$$

$$f'(x) = u(x).\frac{dv}{dx} + v(x).\frac{du}{dx}$$

13. Quotient rule

$$f(x) = \frac{u(x)}{v(x)}$$

$$f'(x) = \frac{v(x)\frac{du}{dx} - u(x)\frac{dv}{dx}}{[v(x)]^2}$$

End of Paper